FACT SHEET FOR PARTNERSHIP FIELD VALIDATION TEST

Midwest Regional Carbon Sequestration Partnership (MRCSP)

NETL Cooperative Agreement DE-FC26-05NT42589

DOE/NETL Project Manager: Lynn Brickett,
Lynn.Brickett@NETL.DOE.GOV

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MRCSP Phase III Large Scale Geologic Injection Test	
Principal Investigator	Dave Ball, Battelle (614-424-4901; balld@battelle.org)
Test Location	Primary Site: The Andersons Marathon Ethanol (TAME) Plant, Greenville, Ohio. Optional Site: Duke IGCC plant, Edwardsport, Indiana
Amount and Source of CO_2	Primary Site: 1,000,000 tons CO_2 over 4 years. Source, TAME Ethanol Plant Optional Site: 2,000,000 tons CO2 over 4 years. Source, Duke IGCC Plant
Field Test Partners (Primary Sponsors)	Primary Site: The Andersons Marathon Ethanol LLC Optional Site: Duke Energy

Summary of Field Test Site and Operations:
MRCSP has proposed a primary and an optional large scale injection site for Phase III. Our primary site, an ethanol plant in western Ohio, is expected to be on line in early 2008 and ready for injection in late 2009 (early FY 2010). Our optional site, a 640MW IGCC plant in Indiana, is expected to be on line in late 2011.

Our proposed Phase III project will involve implementation of injection operations at the primary site, the TAME ethanol plant. Our work at the optional Duke site will be limited to geologic characterization efforts during the first two years of Phase III to increase our knowledge of regional sequestration opportunities.

The following is a detailed description of the TAME project as the proposed primary site. Our optional test site is described in detail in our Phase III proposal but due to space limitations is not described in detail here.

Our primary test site and source of CO_2 is an ethanol plant now under construction near the town of Greenville, Ohio being built by a joint venture of The Andersons Inc. and Marathon Petroleum Company called The Andersons Marathon Ethanol LLC (TAME).

The field test location is about 2 miles southeast of Greenville in Darke County, Ohio (Figure 1). The general area is flat farmland and is moderately developed and populated. The test site itself is located at the TAME Ethanol facility, part of an industrial park being developed by the City of Greenville. The park is located north of Sebring-Warner Road. The plant is located on about 80 acres with various grain storage, process, and staging areas.

Overall, the Phase III project is 10 years in duration. The main activity will involve CO_2 compression, transport, injection, and monitoring of approximately 280,000 metric tons CO_2 per year for 4 years. An initial period of well drilling and testing will be completed to characterize the site. Injection operations will be run for approximately 4 years, which will involve continuous monitoring of the injection system and periodic monitoring of the CO_2 storage field. Injection operations will be followed by a period of post-injection monitoring to ensure that the CO_2 is safely and permanently sequestered in the deep rock formations before the wells are permanently plugged and site restored in accordance with permit requirements.

The main activities in the project will include initial drilling of injection and monitoring wells to depths of less than 4,000 feet, construction support activities for compression and on-site CO_2 transport at the existing TAME ethanol plant, and implementation of a CO_2 storage and monitoring project in deep rock formations at the site. The CO_2 storage field will be contained in a deep saline rock formation (Mt. Simon Sandstone) and a monitoring system will be employed to ensure that the CO_2 is permanently and securely sequestered.

The geologic framework is favorable for carbon sequestration at the TAME site. The site is located along the Cincinnati Arch, a major geologic structure in the region. No major faults have been identified near the site. The Mt. Simon does not outcrop at the surface within several hundred miles of the site. Mt. Simon thickness is estimated at 300 ft at the TAME Ethanol site (Figure 2) at a depth of approximately 3300-3600 ft. The Mt. Simon is generally a white, pink, or purple, fine- to coarse-grained, moderately to well-sorted, quartz arenite that can be arkosic. The Mt. Simon may also contain thin interbeds of red, green, gray, or black, sandy to silty shale. The formation is saturated with brine with total dissolved solids (TDS) in excess of 100,000 mg/l in the project area. The brine density results in slightly higher formation pressures than hydrostatic in deeper rocks and formation pressure is estimated at 1435 psi at the TAME Ethanol site. Rock formations follow a consistent temperature gradient in the region and formation temperatures are estimated to be 88 F at depth.

Figure 1. Site Location Map.

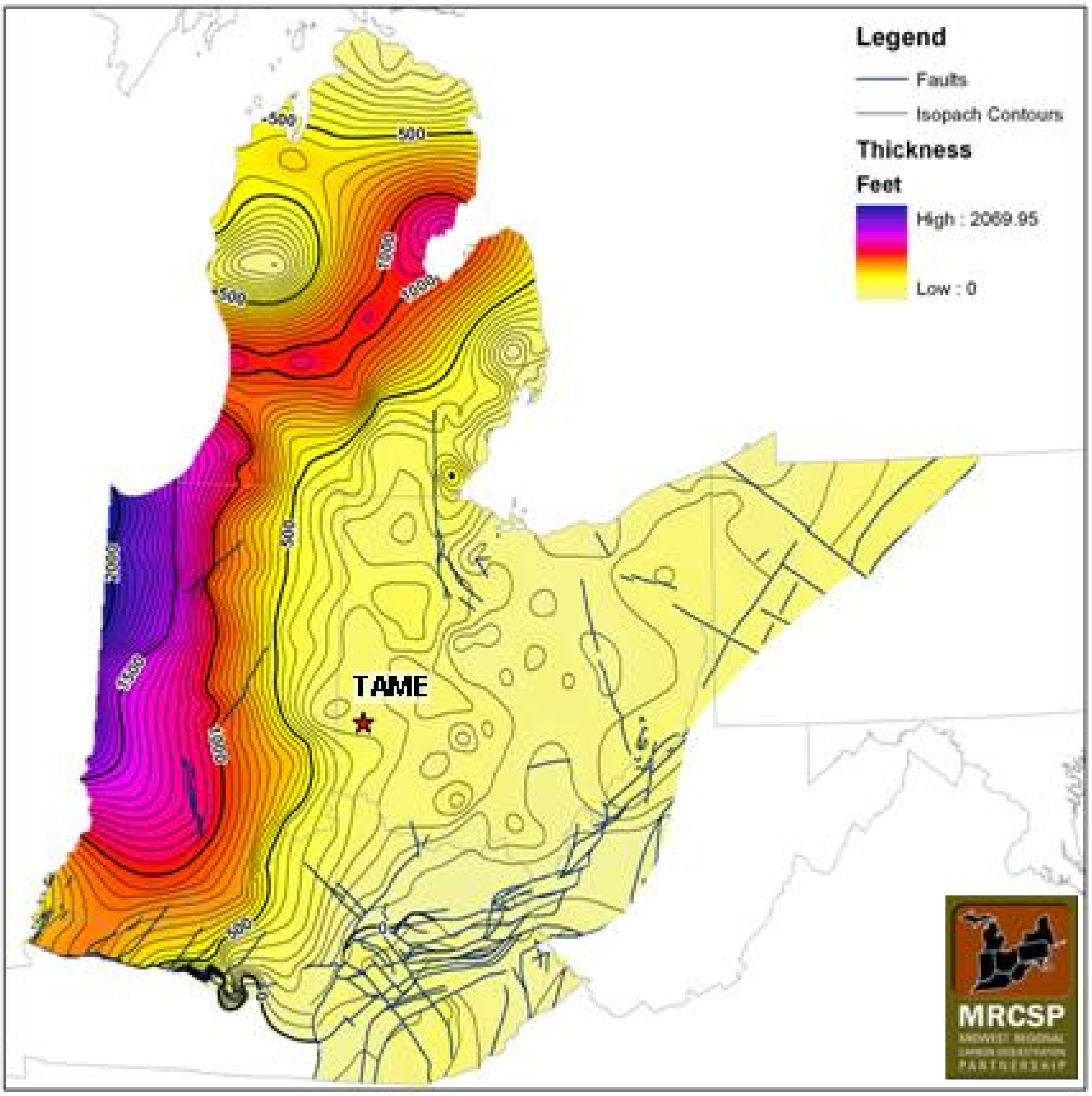

Figure 2. Mt. Simon thickness map for MRCSP region. Regional trends suggest that the Mt. Simon is approximately 300 ft at the TAME site.

Research Objectives:
The goal of the MRCSP Phase III TAME project will be to implement a geologic injection test of a large scale to promote understanding of injectivity, capacity and storage potential in the Mt. Simon Sandstone, a reservoir having broad importance to our region. In the process we expect to test and demonstrate important aspects of CO_2 storage technologies to key stakeholders including the public, environmental groups, government officials, policymakers, and industry. The key aspects to be tested include permitting and stakeholder acceptance, CO_2 handling and compression, local transport, site assessment and development, injection and monitoring operations, site closure or transition to commercial operations, and institutional processes. Specifically, the large-scale injection test planned for the Phase III TAME site will involve approximately 1 million metric tons of CO_2 during the injection period. Further, the MRCSP's goal for Phase III is to translate the knowledge gained from these large-scale Phase III tests so that when it is added to the knowledge gained in Phase II field tests and other MRCSP research activities, we have a better understanding of how sequestration technologies can best be applied on a regional basis for the benefit of all our partners and stakeholders.

Summary of Modeling and MMV Efforts:
Currently, modeling and MMV efforts are in the preliminary stages to support project development and planning issues. An extensive monitoring program will be applied to ensure that the injection system is operated properly and the CO_2 is permanently sequestered in the target rock formations. In addition, advanced computer simulations of the injection process will be completed to assess the CO_2 storage process. Our Phase III proposal describes a comprehensive suite of MMV techniques that we will choose from in making up the specific MMV strategy for the TAME site. One advantage to using a suite of monitoring techniques is the ability to verify the results from one technique with another (i.e. microseismic events corresponding to a change in the velocity field from crosswell seismic or CO_2 well head monitoring confirming bad cement shown in a wireline log). These techniques will also yield information that will continuously be incorporated into existing models to simultaneously verify and refine the results. The aerial extent of the plume will be assessed annually using a combination of injection information and monitoring results, such as injection pressure, injection volume, 3D seismic, crosswell seismic, microseismic monitoring, borehole tiltmeters and fluid sampling. In order to conduct a detailed evaluation of CO_2 sequestration, it is helpful to use numerical reservoir simulations. These simulations are used extensively in oil, gas, and groundwater studies to understand and predict the behavior of fluids in the subsurface under complex hydrogeologic conditions. In the absence of expensive and long-term field experiments, simulations are the most comprehensive means to evaluate the feasibility of geologic sequestration of CO_2. The simulations also provide critical information required for obtaining regulatory permits for CO_2 injection including the reservoir pressure behavior, area of review, and potential for leakage through caprock.

CO_2 storage simulations have been carried out in earlier research by members of the MRCSP team for the Mt. Simon in west-central Ohio near the TAME Ethanol site (Gupta et al 2002). While these early models were not in the exact same location as the proposed projects, the results are similar to what may be expected for these general areas. Key input parameters in the simulations were based on best available regional data, and the parameters are not site specific, but they are fairly reasonable for the Mt. Simon in the respective area. These initial models indicate that injection rates of over 1 million tons of CO_2 per year may be sustained in the Mt. Simon at the TAME site.

Accomplishments to Date:
Accomplishments to date have focused on arranging a CO_2 source, host site, and project coordination:

- Numerous meetings were held with host organizations for both primary and optional sites and visits were made to both sites.
- A project plan was developed specifying site preparation, site characterization, CO_2 compression construction, permitting, outreach, CO_2 injection system installation, monitoring, and site closeout activities.
- An early geologic assessment was completed for the site to summarize sequestration capacity, likely injection formations, and other issues pertinent to geologic storage at the site.
- A preliminary MMV program was developed for the TAME site to outline monitoring objectives and the most suitable technologies that may be applied at the site.
- Technical issues related to CO_2 purification, compression, and handling were examined in light of an ethanol CO_2 source. Specifications were compiled for CO_2 compression of the 280,000 tons per year source.

Summarize Target Sink Storage Opportunities and Benefits to the Region:

- The Mt. Simon Sandstone is the most promising target for CO_2 sequestration in the Midwest, and it has the largest sequestration potential of any individual geologic unit within the MRCSP region. Phase I MRCSP estimates of storage capacity in the Mt. Simon suggests capacity to store 86,900 million metric tons of CO_2. Emissions from large point sources in the MRCSP region are approximately 765 million metric tons CO_2

per year. The Mt. Simon should have the capacity to store at least 50% of the regional emissions from point sources for at least 100 years (i.e., 38,250 million metric tons CO_2).

- Added value in sequestering anthropogenic CO_2 as a byproduct from ethanol plant, resulting in net sequestration of CO_2.
- Promotes CO_2 sequestration at ethanol plants, one of the most feasible near-term CO_2 point sources throughout the MRCSP region.
- Continues to develop and establish a CCS framework in the region with ongoing geologic framework, regional carbon sequestration exploration, and outreach efforts.
- This project will research critical CO_2 storage mechanisms including containment by caprock, capillary trapping, dissolution, and mineralization in the Mt. Simon Sandstone through an elaborate and integrated program of characterization, modeling, monitoring, and laboratory characterization.
- The MMV program will assess the changes in physical characteristics in the injection formation, both at the on set of injection, as well as at future monitoring intervals, to continue to build long-term commercial geologic sequestration guidelines.
- Evaluate handling and injection of CO_2 from sources such as ethanol and coal gasification that are likely to grow significantly in response to national energy policy.
- Evaluate and enhance the ability of models to accurately predict the behavior of injected CO_2 through utilizing field measurements.
- Establish integrated modeling which would incorporate regional structure, topography, non-linear formation properties, geophysical properties and possible leakage pathways.
- Evaluate new and experimental monitoring techniques for their applicability to geologic sequestration, specifically in the geologic provinces in the Midwestern US

Cost*:	**Field Project Key Dates (as proposed):**
Total Project Cost: $93,000,000 **DOE Share: $61,000,000 (65.6%** **Non-Doe Share: $32,000,000 (34.4%** (*) Projected costs for overall MRCSP Phase III project	**Baseline Completed: Winter 2008-2009** **Drilling Operations Begin: Spring-Summer 2009** **Injection Operations Begin: 2010**